

What I claim is:

1. A curable adhesive composition comprising in combination:

a curable polymeric base material and contained in said polymeric base material,

- 5 (I) inorganic insulator particles having average particle size of 1 μm to 1000 μm and a major axis to minor axis ratio of about 1.0 to 1.5, said inorganic insulator particles being present in the composition in an amount sufficient to provide a planar adhesive bond thickness between substrates being joined by said adhesive, and
- 10 (II) at least one low coefficient of thermal expansion filler having an average particle size of less than 10 μm in an amount of at least greater than 50 weight percent based on the weight of the curable polymeric base material, wherein the low coefficient of thermal expansion fillers having sizes of
- 15 greater than 10 to about 100 μm are present in less than 0.1 weight percent based on the total weight of the low coefficient of thermal expansion fillers present in the adhesive composition.

2. A curable adhesive composition as claimed in claim 1 wherein the inorganic insulator particles are fused silica particles.

3. A curable adhesive composition as claimed in claim 1 wherein the inorganic insulator particles are alumina particles

5 4. A semiconductor device in which at least two individual substrates are joined and bonded by an adhesive composition as claimed in claim 1.

5. A process for joining at least two individual substrates, said process comprising:

(I) applying an adhesive composition as claimed in claim 1 to at least one surface of at least one of the individual substrates;

(II) mounting another individual substrate to the adhesive treated side of the substrate of (I) to form a laminate thereof;

(III) applying pressure to the laminate to disperse the adhesive therebetween until each of the substrates contact the largest organic insulator particles of the adhesive composition, and thereafter,

(IV) curing the adhesive composition.

6. The process as claimed in claim 5 wherein additionally, heat is applied in step (III).

7. The semiconductor device as claimed in claim 4 wherein the two individual substrates are a semiconductor die and an attachment substrate for the semiconductor die.

8. The process as claimed in claim 5 wherein the two individual substrates are a semiconductor die and an attachment substrate for the semiconductor die.

9. The adhesive composition as claimed in claim 1 wherein the adhesive base material is selected from the group consisting essentially of:

(a) a curable silicone composition;

(b) a curable epoxy composition;

(c) a curable polyimide composition, and,

(d) a curable acrylic composition.

10. An adhesive composition as claimed in claim 9, having a cure mechanism selected from the group consisting essentially:

- (ii) condensation reactions;
- (iii) addition reactions;
- (iv) ultraviolet initiated radiation reactions, and,
- (v) free radical initiated reactions.

11. An adhesive composition as claimed in claim 9 wherein the adhesive base material is a silicone composition.

12. An adhesive composition as claimed in claim 11 wherein the silicone composition is an addition reaction curable silicone composition.

13. An adhesive composition as claimed in claim 9 wherein the adhesive base material is an epoxy composition.

14. An adhesive composition wherein insulating particles are present in an amount sufficient to obtain an adhesive with linear thermal expansion coefficient before and after any glass transition temperature of less than $240 \mu\text{m}/\text{m}/^\circ\text{C}$, between -55°C and $+200^\circ\text{C}$ when measured at a heating rate of $5^\circ\text{C}/\text{minute}$.